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CHAPTER ELEVEN

AUTOBIOGRAPHICAL MEMORY

Many of the issues presented in other chapters covered aspects of human memory, such as knowing how to ride a bike, remembering whether a word has been seen before, or knowing what a bird is. While these are important, there are other factors that are important to who we are as people. These are the memories that make us unique. They help form our identities and give structure to our lives. When we meet new people, an important part of getting to know one another is to exchange memories, often by providing excerpts from our life story. The memory of our life story is **autobiographical memory,** and it is the focus of this chapter. Autobiographical memory covers events and other knowledge about your life. This chapter covers general characteristics of autobiographical memories and the various levels of detail in them. We consider how autobiographical memory has a narrative character and how it changes over time and develops, including infantile amnesia for our earliest memories and a reminiscence bump for central portions of our lives. Finally, we cover issues involved with flashbulb memories for surprising events.

CHARACTERISTICS OF AUTOBIOGRAPHICAL MEMORIES

In this section we examine what autobiographical memories are. This includes their relationship to episodic and semantic memories, their nature, and the ease with which they are retrieved.

Episodic or Semantic?

Because autobiographical memories are about a person's own life, are they a kind of episodic memory? In a way, they are. However, they are much more than that. Autobiographical memories go beyond the information found in episodic memory alone. They are far more constructive and integrative, often spanning multiple events. In contrast, episodic memories are each confined to a single event.

Autobiographical memory also contains generic information, such as your address, phone number, your job, and so on. Much of your life story involves relatively stable, semantic-like information. Still, autobiographical memories differ from semantic memories in that they are unique about our lives. There is an intimate relationship between semantic and autobiographical memories. Not only does autobiographical memory have semantic aspects, but semantic memories are influenced by autobiographical memories. For example, semantic knowledge of famous people is more available if they are autobiographically significant, such as a personal hero, even when you account for frequency and recency of exposure (Westmacott & Moscovitch, 2003).

Varieties of Information. Autobiographical memories are about events in our lives and how they are interrelated. This may involve integrating events separated by long periods of time. They are amalgams of all kinds of information about our everyday experiences, including knowledge of sensory experiences (what things looked, sounded, smelled like, etc.), where things happened, how people acted, what people said, and what emotions were felt (Rubin, 2006). Moreover, autobiographical memories contain many interpretive inferences about how an event relates to others and what it means to us.

We gain some insight into autobiographical memories by looking at retrieval. Typically, people report general information followed by specific details (Anderson & Conway, 1997). For example, a person may report something like "I remember when I was in high school back in Cleveland Ohio. I had this Latin teacher. He used to constantly terrorize our class. It was horrible. I remember one day he gave a really hard exam. To make sure we didn't cheat, he put a chair up on his desk at the front of the class. He then sat on the chair, staring at us all, making us more nervous and tense than we already were." It is more unusual for people to report information in the reverse order, starting with the details and working out to general information. This suggests that autobiographical memories are organized around general themes. Within these more generalized chunks are the details of our lives.

This organizational structure suggests that autobiographical memories are complex. They contain information at a variety of levels of detail and span broad periods of time. This complexity causes people to take longer in retrieving an autobiographical memory (2–15 seconds) than a typical episodic or semantic memory (1 or 2 seconds) (Anderson & Conway, 1997). This slower processing time reflects a need to access more information and to sort through the autobiographical structure to locate specific memories.

Synopsis

Autobiographical memory is a complex form of memory with components borrowed from episodic and semantic memories. Autobiographical memories are woven out of basic knowledge about the events in our lives, along with the inferences and interpretations of these events.

LEVELS OF AUTOBIOGRAPHICAL MEMORY

Autobiographical memory is hard to simply and easily describe because it is made up of different types of information. One way to parse this type of knowledge is by the length of time covered (e.g., Conway, 1996). There are three levels that can be addressed: (1) the *event level*, for specific, individual events; (2) *general events*, for extended sequences or repeated series of events, often sharing a common component (as compared to a strict temporal sequence); and (3) *lifetime periods*, for theme-based parts of a person's life.

An example of the organization of these different levels is shown in Figure 11.1 (Conway, 1996; Conway & Pleydell-Pearce, 2000). At the top are two lifetime periods, which happen to overlap: the relationship and work themes. Within each of these are a number of components. Each of these components is associated with a collection of general events. For example, in the work theme, "working at A" is associated with a number of general events, such as "first day at work," "working in the C office," and "drinks in the evening with W." Each general event is also associated with memories of specific episodes at the lowest level of the hierarchy. While this organization shows some structural stability, it can be altered to some degree by the cues used at retrieval (e.g., Odegard, Lampinen, & Wirth-Beaumont, 2004).

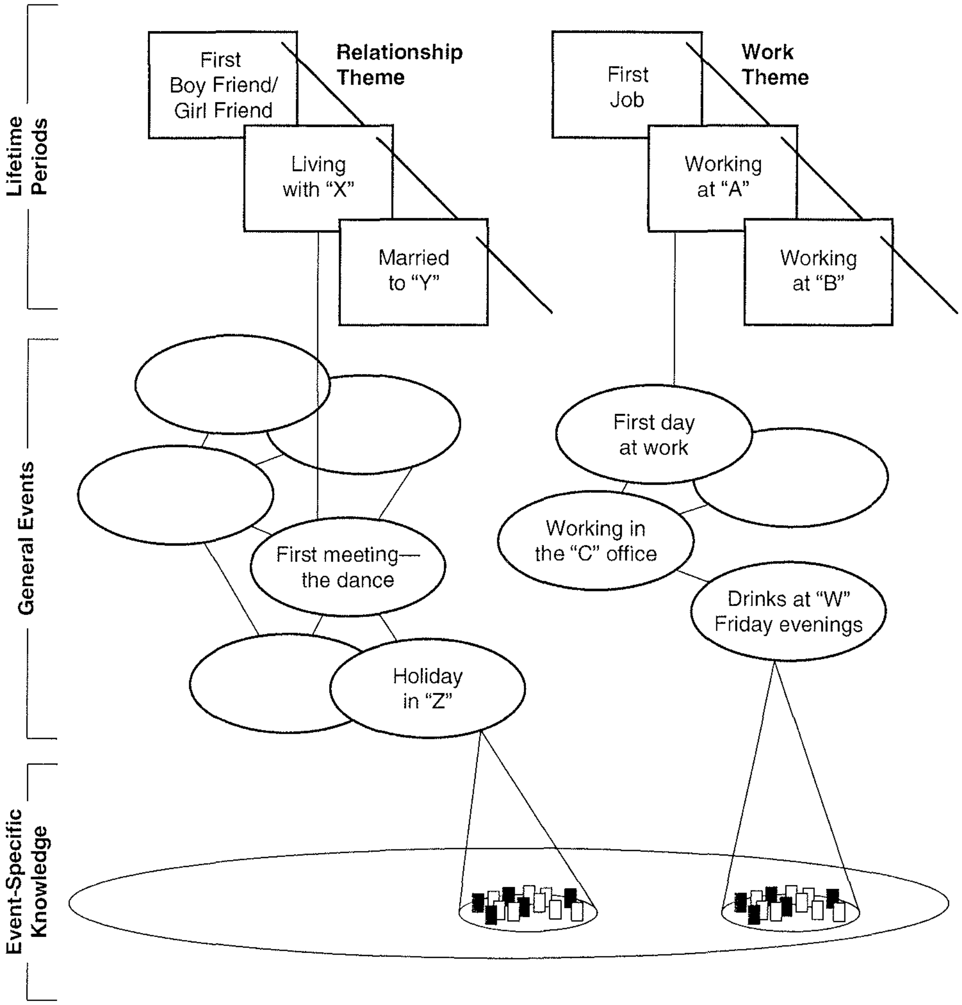

FIGURE 11.1 Hierarchy of Autobiographical Memories

Source: Conway, M. A. (1996). Autobiographical memory. In E. L. Bjork & R. A. Bjork (Eds.) *Memory.* San Diego: Academic Press

Event-Specific Memories

The **event-specific** level closely corresponds to episodic memories. These are memories for specific, periods of time that involve a common activity occurring at a particular place. For example, the Latin teacher sitting on his or her chair while perched on his or her desk is an event memory. Event memories contain many perceptual and contextual details about what things looked or sounded like, as well as details about time and space. Finally, event memories contain internal context information, such as the person's emotional reaction to the event or physiological state at the time.

While most event-specific memories are lost over time, others endure and become important singular memories. This is the opposite of many memory processes that make things more semantic and schematic (Pillemer, 2001). For an event-specific memory to be retained as a single event, it needs to have a special quality. Pillemer outlined four ways of doing this. First, they can be memories of initial events that have many goal-relevant memories that follow them—for example, a memory of a childhood experience of going to the hospital for an injury sets a person on the path toward becoming a doctor. Second, they can be memories of turning points when a person's life plan is redirected—for example, being injured in a car accident. Third, they can be memories of anchoring events that serve as a basis for a major belief system—for example, having a religious experience. Finally, they can be memories of anomalous events that are used to guide future behavior—for example, remembering an embarrassing incident at work when a person got caught goofing off when the temptation arises to do that again. These qualities of event-specific memories make them easy to remember and hard to forget.

General Event Memories

At an intermediate level are **general events**, which are of two types. One type is a sequence of events that forms a larger episode. For example, the first day on the job is a general event composed of the various specific events of that day, such as being given a tour of the building, assigned a desk, given literature on company policies and benefits, and so on. The extension of an event across time and space occurs because people unify smaller events by one or more common themes (Burt, Kemp, & Conway, 2003).

The other type is a repeating event. For example, your memory for a class taken last year is a general event. The different class sessions are not a sequence of events because they were separated by large periods of time. Still, the repeated event quality of the class can organize experiences into a general event of being in that class. For both types of general events, there is often a personal goal that is affected by the extended event.

The creation and storage of general event memories require integrative and interpretive thinking. They are integrative because different events are brought together into a common memory. This is particularly clear for recurring situations. They are interpretative because a person must understand how the sub-events go together. For example, in a memory of a class, the memory for receiving an exam grade must be related to the memory for taking the exam and those for studying before that.

Lifetime Period Memories

At the highest level of the hierarchy are **lifetime periods.** These are periods of life organized along a common theme, such as "early childhood," "education," or "career." Lifetime periods give a sense of the progression and development of life in the service of various goals or preferences. When people recall autobiographical memories, if they go beyond a single general event, they are likely to confine their retrieval to a given theme (Barsalou, 1988). For example, when recalling information about previous work experience, they are unlikely to recall information about the various relationships they were involved in, unless those relationships in some way overlapped with their work experiences (such as dating a coworker).

Evidence for the Hierarchy

This autobiographical memory hierarchy is more of a heuristic than a hard-and-fast categorization. There are many cases where it is unclear at what level a given memory belongs. Also, information may be divided into subcomponents at the different levels. For example, a general event may be broken down into other general events, such as a memory for a class being broken down into different parts of a semester. Thus, autobiographical memories have a recursive quality in which smaller and smaller parts can be nested in larger description (Barsalou, 1988). An example of this recursive decomposition is shown in Figure 11.2

People typically have different aspects of their lives going on concurrently. Thus, there is some overlap of extended life events. Thus, there are a number of ways that autobiographical memories relate to one another (Barsalou, 1988). For example, Figure 11.3 illustrates events from different lifespan periods overlapping in time.

Neurological Evidence. Despite the fuzzy nature of this division of autobiographical memory, it has some neurological support. Some people with dense amnesia can recall lifetime period and general event information but not specific episodes. One patient, S. S. became amnesic after a case of herpes simplex encephalitis when he was about 40 years old (Cermak & O'Connor, 1983; McCarthy & Warrington, 1992). The virus damaged part of

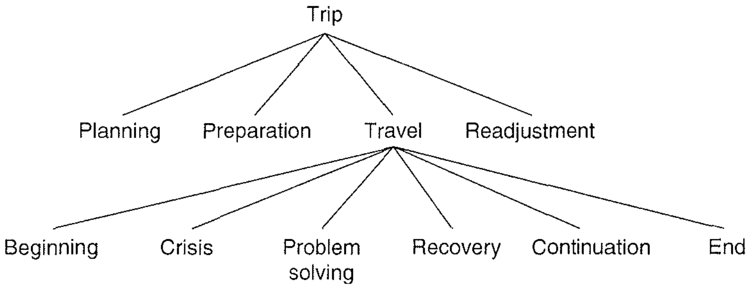

FIGURE 11.2 The Recursive Process of Breaking Down an Autobiographical Memory into Smaller and Smaller Parts—In This Case, a Memory of a Trip

Source: Barsalou, L. W. (1988). The contents and organization of autobiographical memories. In U. Neisser & E. Winograd (Eds.) *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory.* New York: Cambridge University Press.

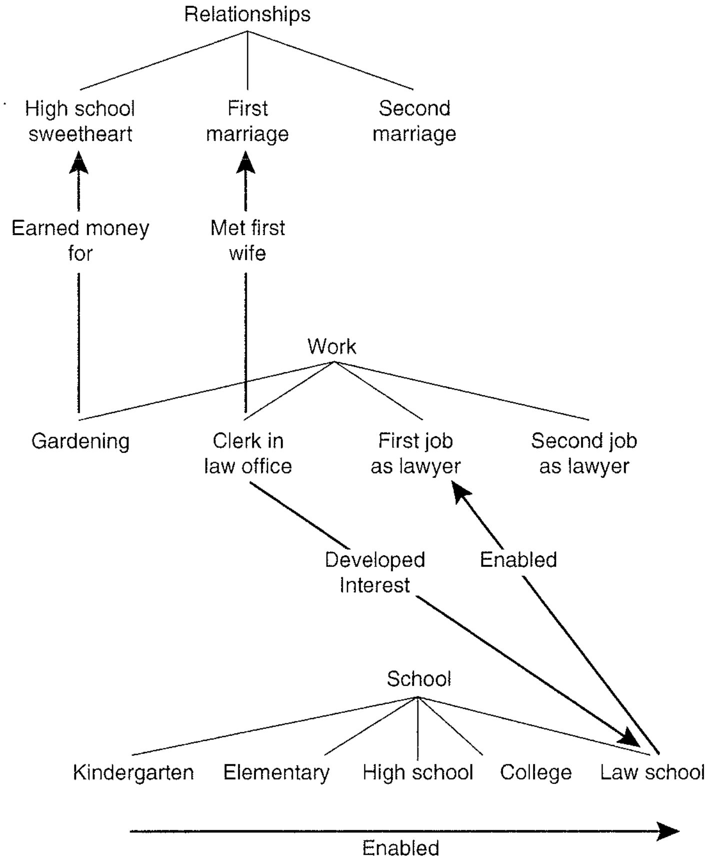

FIGURE 11.3 Temporal Overlapping of Various Lifetime Periods with Different Themes Based on Common, Shared Specific, and General Events

Source: Barsalou, L. W. (1988). The contents and organization of autobiographical memories. In U. Neisser & E. Winograd (Eds.) *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory*. New York: Cambridge University Press.

his left hemisphere. Although he was of high intelligence (I.Q. of 133), he had severe memory problems. S. S. cannot remember specific events from his life, but can recount general aspects of his life experiences, such as his job. So, although he had trouble remembering at the event level, he could remember at the general and lifetime period levels.

A similar case is K. C., who suffered damage to the frontal-parietal region of his left hemisphere and the parietal-occipital region (B.A. 7 & 39) of his right hemisphere as the result of a motorcycle accident at the age of 30 (Tulving, Schacter, McLachlan, & Moscovitch, 1988). He cannot remember any life events. For example, he cannot remember the circumstances of his brother's tragic drowning death ten years before. However, he does remember semantic knowledge including knowledge of his job, which he had recently begun, and even personally relevant information, such as the floor plan of the house he grew up in (although he can't say which room was his), the names of his school classmates, and places where he has vacationed. This distinction between what is and what is not remembered reinforces the idea that autobiographical memory for events is a separate form of memory from more general knowledge.

In contrast, K. S., who had a right anterior temporal lobectomy to control her epileptic seizures, could recall specific life events but not general knowledge about the people involved (Ellis, Young, & Critchley, 1989). She also had trouble with the names of famous people and product brands. Thus, in a sense, she had the ability to store memories at the event-specific level but not more general information.

Another person with autobiographical memory trouble was P.S., a man in his late 60s with bilateral damage to his thalamus. This condition led to profound anterograde amnesia as well as extensive retrograde amnesia for autobiographical memories, but not semantic, non-personal information (Hodges & McCarthy, 1993; McCarthy & Hodges, 1995). For instance, although he is married, he cannot recall any details of his wedding. He also knows that he has three sons but cannot provide any details about their births. He also does not recognize photos of family events. However, he can recognize famous faces accurately, and can place them in chronological order for when they were famous, but cannot remember public events (e.g., the Watergate scandal). Thus, P.S. has lost the ability to remember autobiographical events, as well as the people involved in the events, and this deficit extends to memory for other types of events.

Synopsis

Autobiographical memory has three levels. At the event-specific level are memories of individual events, which is closest to episodic memory. At the general event level are memories for extended and repeating events. Finally, at the lifetime period level are memories that span broad, thematically related parts of our lives. This hierarchy is supported by studies of the effectiveness with which people retrieve memories as well as neurological evidence from brain damaged patients who have selective deficits.

AUTOBIOGRAPHICAL MEMORY AS LIFE NARRATIVE

Autobiographical memories are **life narrative** memories (McAdams, 2001). This follows a general human tendency to organize our experiences into narrative structures (Bruner, 1991), rather than simply a structure based on semantic information (Conway & Berkerian, 1987). Because autobiographical memory is a kind of story, it should reveal such characteristics. People often access information in autobiographical memory using event components that are found in narratives, such as people, places, activities, and other thematic information (e.g., Barsalou, 1988; Burt, 1992; Burt et al., 1995; Conway 1990; Lancaster & Barsalou, 1997; Wagenaar, 1986).

When people are probed for autobiographical memories, they tend to retrieve them in clusters of other events from a similar time (Brown & Schopflocher, 1998b), as is expected if they are part of a story. Moreover, people are most often reminded of events that are causally related (either as a cause or as an effect), and are reminded of events that share the same person, place, or activity (Brown & Schopflocher, 1998a), similar to how people organize their memories of actual stories (Zwaan & Radvansky, 1998).

To give autobiographical memories a narrative style, people may draw on semantic memory. As is discussed in Chapter 9, people have scripts of common events. These are used to structure autobiographical memories, giving them the temporal order of the script. In fact, people are better at recalling life events in a forward order and are faster at recognizing the first and more important details of the event (Anderson & Conway, 1993). For example, if you remember a trip to a restaurant, you are more likely to replay it back in your mind in a forward order, as it was experienced. However, if you were just thinking about one or two important details, such as a marriage proposal, you would to be able to retrieve it quickly without the need to start at the beginning.

While narrative structure is important, it is not always observed and information about temporal order may be missing. In a study by Burt, Watt, Mitchell, and Conway (1998), people took photos during the course of their daily lives. Later, they were shown the pictures for the first time with the task of putting the pictures in the correct temporal order. Performance on this task was terrible. People were correct only 9 percent of the time, although they did better if less than a week had passed, in which case they were 35 percent correct. This may have occurred because the snapshots were random bits that did not create well-defined narratives and so were difficult to correctly structure and order.

Perspectives in Autobiographical Memory

Narrative structure also shows itself in our experience of autobiographical memories. When you think about your life events, there may be an accompanying mental image. The thing is that these images vary in their perspective. Sometimes we experience a memory from our original perspective, with the same perceptual field of view. These are called **field memories.** In contrast, at other times, we view the event from outside of ourselves and may see ourselves in it. These are called **observer memories** (Nigro & Neisser, 1983). The very fact that we have observer memories emphasizes the constructed nature of autobiographical memory.

There are three factors that influence how a memory is experienced (see Table 11.1). One is the age of the memory with older memories being more likely to be observer memories. Second is the emotionality of the memory, with more emotional memories being more likely to be experienced as field memories. Finally, the greater one's self-awareness in a situation the more likely he or she is trying to understand his or her role in the larger event, and so this tends to lead to more observer memories. For example, an observer memory is more likely to be generated when one remembers giving a speech.

TABLE 11.1 Dimensions and Criteria for Field and Observer Memories

DIMENSION	FIELD MEMORY	OBSERVER MEMORY
Age of memory	Newer	Older
Emotionality	More emotional	Less emotional
Self-awareness	Less self-aware	More self-aware

Schema-Copy-Plus-Tag Model

People use schemas and scripts to help reconstruct incomplete autobiographical memories. The older autobiographical memories are, the more schema-consistent people's reports are likely to be (Eldridge, Barnard, & Bekerian, 1994). Thus, in an important sense, schemas guide the formation of our memories and strongly influence how and what we remember. However, if you think about your life, it does not feel like you have a memory full of generic, stereotypical events. Instead, you tend to remember the parts that are unusual. Memory is heavily schematic, but what is schema-inconsistent tends to be more memorable.

So what is the solution here? One idea is that our memories represent both schematic and unique aspects of an event. This is the **schema-copy-plus-tag model** (e.g., Graesser, Gordon, & Sawyer, 1979; Graesser & Nakamura, 1982; Graesser, Woll, Kolwalski, & Smith, 1980; Nakamura & Graesser, 1985; Trafimow & Wyer, 1993). When you encounter a new event, you first activate the appropriate schema. That schema, or at least the more relevant parts of it, will be the basis for your event memory. This schema helps reduce the need to actively think about and process every little detail. One can simply assume that most of them are about the same as they usually are.

In addition, people associate "tags" with a memory trace to denote the important things that are inconsistent with the schema, thereby making the memory unique. For example, if you go to a restaurant and the manager tells you that you do not have to pay, this is going to be represented by a tag in memory. Because autobiographical information is focused on the self, people show a greater benefit for tagged information when the memory involves themselves or another familiar person (Colcombe & Wyer, 2002).

Item-Specific and Relational Processing. This use of schemas and tags is in line with the distinction between item-specific and relational processing (see Chapter 7). Schemas provide relational processing, whereas the tags serve as item-specific processing. Memory for event information can further be influenced by how information is learned. Learning that emphasizes the structure of the event, such as sorting things based on themes, facilitates the schematic aspect, whereas learning that emphasizes item-specific processing, such as filling in missing letters in words, facilitates the tag aspect (Hunt, Ausley, & Schultz, 1986). This distinction between the schemas and the tags also parallels fuzzy trace theories.

Representing autobiographical knowledge this way has two consequences. First, because trivial details are less likely to be directly represented in a memory, it is difficult for people to distinguish between schema-consistent parts that were actually present and those that were not. Second, because the tag is part of the memory, it is easy for a person to remember what was odd about an event. This has some unfortunate consequences for education. Students' memories for what happened during class is often better for unusual things that happened during lecture, such as spilling coffee or jokes that were told, as compared to the content of the lectures (Kintsch & Bates, 1977; Nakamura, Graesser, Zimmerman, & Riha, 1985).

Synopsis

Autobiographical memory is structured as a life narrative, paralleling the structure seen for actual stories. This is seen in the distinction between field and observer perspectives. Although autobiographical memory construction and retrieval is guided by schemas, people use tags to help remember odd and unusual but important aspects of an event.

EMOTION AND AUTOBIOGRAPHICAL MEMORY

A central aspect of our experience is the emotions we feel during events, as well as our emotional reactions when we remember. Like most memories, autobiographical memory has a forgetting curve. People better remember more recent events than older ones (Whitten & Leonard, 1981). However, emotion adds some complexity. First, consistent with the Pollyanna principle, over time there is a tendency to remember pleasant events better than unpleasant ones (e.g., Wagenaar, 1986), which are forgotten more rapidly (Holmes, 1970; Meltzer, 1930), and with the emotional intensity of negative events being tempered more so than positive events (Walker, Skowronski, & Thompson, 2003; Walker, Vogl, & Thompson, 1997).

Although there is a bias to remember more positive things, we do have many clear, well-remembered negative emotional events such as those involving anger, shame, and depression. These negative autobiographical memories differ in some ways from positive ones. For instance, people tend to focus more on central details, and less on peripheral details, of negative memories (Berntsen, 2002), leading to better detailed memory for things in the focus of attention (Kensinger, 2007). This is likely brought on by increased activity in the amygdala during negative events.

The increased focus on details in emotional memories is called **tunnel memory** (Safer, Christianson, Autry, & Österlund, 1998). Tunnel memories also alter other memory phenomena. For example, they are less likely to exhibit boundary extension (see Chapter 5), perhaps because these central details are more critical in a negative event (e.g., an automobile accident), whereas positive events are less likely to hinge on a single critical detail (e.g., falling in love). In general, the influence of emotion on memory is driven more by the intensity of the emotion, than by whether it is positive or negative (Talarico, LaBar, & Rubin, 2004).

Olfactory cues (the smell of things) are special for autobiographical memory. Odors are particularly effective at helping people remember events from their lives (Chu & Downes, 2002), are more likely to elicit memories that people rarely think about (Rubin, Groth, & Goldsmith, 1984), and are more likely to elicit memories from the first decade of life than are words or pictures (Willander & Larsson, 2006, 2007). The autobiographical memories elicited by odors tend to be more emotional than those elicited by other memory cues (Herz, 2004; Herz & Cupchik, 1995; Herz & Schooler, 2002). This may be because the olfactory nerves are more directly connected to the amygdala, which, in turn, is critically important for emotion processing. In essence, smells are more directly connected to emotional experience, and so are more likely to call emotional memories to mind.

Involuntary Memories

While the retrieval of autobiographical memories may require additional time and effort, there are occasions when they are retrieved spontaneously and involuntarily (Ball & Little, 2006; Berntsen, 1996; 2001; see Kvavilashvili & Mandler, 2004, for a similar idea for semantic memories). Such spontaneous memories, especially negative ones, are a symptom of post-traumatic stress disorder (PTSD) in which a person has involuntary flashbacks to a negative, aversive event, which can be quite persistent (Berntsen, 2001), and may be one of the driving forces behind PTSD (Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008).

With PTSD, these traumatic memories are often quite accurate (Alexander, et al., 2005), even after a long period of time (Porter & Peace, 2007). That said, involuntary memories occur in unaffected people as well (Berntsen & Rubin, 2008), although most ordinary involuntary memories are about positive, rather than negative, events (Berntsen, 1996, 2001).

For traumatic memories, as with PTSD, steps can be taken to lessen their severity using what is known about autobiographical memory. When people with PTSD remember traumatic events, they feel more stress and anxiety when they recall them from a field memory than from an observer memory perspective (McIsaac & Eich, 2004). Taking the view one had during an event is more likely to reinstate the emotional and physiological states of the time. However, taking an outsider's perspective helps detach the person from the event and reduces the anxiety that comes from remembering it. That said, observer memories may also contribute to the perseveration of PTSD symptoms over the long term (Kenny et al., 2009). Also, although there can be directed forgetting (see Chapter 14) of autobiographical memories (Joslyn & Oakes, 2005), salient negative involuntary memories, such as those associated with PTSD, are responded to very emotionally (Berntsen & Hall, 2004), and attempts to use directed forgetting may have opposite effect of making them more prominent (Dalgleish, Hauer, & Kuyken, 2008).

Synopsis

With autobiographical memory the general bias is to remember positive memories. When people remember negative events, they may be tunnel memories that focus on the central details. More generally, autobiographical memory characteristics are guided more by the intensity of the emotions than their valence. Finally, although most involuntary memories are emotionally positive, in some cases, they are negative, and may take a pathological bent when they are associated with PTSD.

AUTOBIOGRAPHICAL MEMORY OVER TIME

Like most memories, autobiographical memory shows a forgetting curve. People remember recent events better than older ones (Whitten & Leonard, 1981). Oddly enough, this forgetting curve extends to events that happened prior to birth (Rubin, 1998), which reflects an interest in historical events that led up to the current situation (Brown, 1990). There are two major deviations to the forgetting curve. The first is the poor memory for very early life experiences, called infantile amnesia. The second is the very good memory for life experiences around the age of 20, called the reminiscence bump.

Infantile Amnesia

Let's look at our memories from when we were infants. But wait. Where *are* they? Most adults, if they think about it, find that their earliest memory is not from infancy but from when they were between the ages of 2 and 4. (It is possible to have autobiographical memories from as early as ages 18 to 24 months, but not earlier [Howe, 2003)]. These earliest memories are often fragmented, such as a memory of standing in a room, whereas more episodic memories are regularly reported about a year later (Bruce et al., 2005).

Occasionally, people report memories from even earlier ages. However, many of these "memories" were generated in response to seeing pictures, hearing stories told by older relatives, or other sources. Thus, they are not memories of the event itself.

My earliest memory is from when I was 2½ years old. My parents had just moved to Wisconsin, and we were living in a trailer until they could find a house. It was late December, and I remember ice creeping in underneath the door. Because my family was new in town, some of my father's new coworkers wanted to help out. So one of them came to the trailer one evening dressed as Santa Claus to give me a thrill. (He already had a Santa suit because he had discovered that when he wore it to a bar, someone always wanted to buy Santa a drink.) When he walked into the trailer, I was terrified. I remember crying and screaming and running into my bedroom to get away from this big, red, creepy-looking guy who had burst into my home and started ho hoing at me.

So what happens to memories of a person's life before the age of 2 or so? Clearly there is a lot of learning during this time, and information is being stored in memory, such as learning how to walk and talk. However, this learning does not have a quality that allows us to remember those events. They are forgotten. This absence of early childhood memories is **infantile amnesia.** So, why does infantile amnesia occur?

Psychodynamic View. One of the first people to take note of infantile amnesia was Sigmund Freud (1899/1938), whose explanation was integrated into his psychodynamic theories. In Freud's scheme, many psychological problems involved sexual thoughts and desires. Infantile amnesia was no exception. For Freud, infants go through a period of sexual thinking and wishing. Part of this is a desire to be sexually intimate with our opposite-sexed parent. As we mature, we take on the rules and norms of our culture in the development of the superego. At this time we learn that our incestual thoughts are taboo. To protect ourselves from this threatening and horrible knowledge about ourselves, our subconscious blocks from consciousness all memories from this time. This grand scale repression is so successful that people have no memory of when they were infants. Freud's theory makes interesting reading, and it fits well into his broader theories. However, there are few people today who accept this view of infantile amnesia.

Modern Views

There are several plausible modern ideas about the cause of infantile amnesia, and there are multiple factors that contribute to it.

Neurological Development. A neurological account is based on the state of neural structures in the course of development. For example, the hippocampus, an important structure in creating new memories (see Chapter 2), and whose damage can lead to severe amnesia (see Chapter 16), is undeveloped at birth. It does not reach adult form until a child is a few years old (Nadel & Zola-Morgan, 1984). Also, infants have less developed frontal lobes. This part of the brain is important for binding contextual factors in memory, allowing for such things as source monitoring (see Chapter 12). This inability to link different aspects of experience leads to an inability to form autobiographical memories (Newcombe et al., 2000). Finally, during infancy and early childhood, the ability to consolidate memories is underdeveloped, leaving the memories more prone to interference from later events (Bauer, Burch, Scholin, & Güler, 2007), thereby contributing to infantile amnesia. In general, infantile amnesia reflects a period of time when infants are acquiring but not retaining, complex and neurologically sophisticated episodic memories (see Chapter 15).

Schema Organization. Another idea is that infants are trying to understand how the world works and are still developing their schemas. For example, a child might remember what typically happens on a trip to McDonald's but not remember the details from a given trip. Relatedly, young children tend to focus more on inappropriate aspects of an event. As schemas become more developed, people have difficulty retrieving the prior memories that were formed with the old schemas.

Language Development. An important thing to note is that the time when infantile amnesia lifts is also the time when language acquisition is making significant strides (Nelson, 1993). Infantile amnesia may reflect an inability to organize information into a coherent life narrative, which can then be used to help retrieval. Early on, infant memory has two roles: either as a generic schema-driven memory or as a repository for temporary episodic memories. With the advent of language, and the need to share experiences with others in a social context, autobiographical memory develops. So the chaotic jumble of memories, that is infantile amnesia, is displaced with the organization of a new autobiographical memory. This is supported by work showing that preverbal children do not translate nonverbal knowledge into verbal information after they learn how to talk about those events. The memories appear to stay nonverbal (Simcock & Hayne, 2002), which makes them more difficult to retrieve (Richardson & Hayne, 2007).

Emergent Self. Infantile amnesia is also related to a development in how people think about themselves. From this view, the removal of infantile amnesia is a function of a person developing a sense of self as a unique and an identifiable entity. Newborn infants lack a clear sense of self as a separate entity from the environment. The development of the self is divided into the acquisition of the "I' and the "me." The "I" is the subjective sense of self as a causal agent, whereas the "me" is the objective sense of self, such as your personal features. This latter sense of self emerges around 18 months and is fairly well established by 24 months. Once this concept of self is established, autobiographical memory can be constructed around it. Again, the offset of infantile amnesia corresponds to the onset of autobiographical memory.

Multicomponent Development. The **multicomponent development theory** (Nelson & Fivush, 2004) is the idea that there are a number of memory abilities that emerge to bring about autobiographical memory. These components include the development of an adequate episodic memory system, the development of language and narrative skills, an understanding of how adults think and talk about the world and the passage of time, as well as how the person understands himself or herself. The interaction of these multiple influences is reflected in the fact that people in different cultures experience different offset ages for infantile amnesia. For example, people in Western cultures, such as the United States, come out of infantile amnesia six months earlier than people living in Asian cultures (Wang, 2004). This may be because in these cultures children interact differently with adults, with a greater focus on the self in Western cultures.

Reminiscence Bump

Another influence of autobiographical memory on the standard forgetting curve is something that is easier to observe as a person ages. Memories of a person's life tend to be dominated by events from around the age of 20 (between 15 and 25). In these studies, the Galton-Crovitz method is used. This is a free association paradigm in which people are given lists of words—such as "bird," "chair," "apple"—and are asked to recall the first memory from their life that comes to mind. Most of the memories are from the recent past, and the further back in time one goes, the fewer memories there are, just as in a standard forgetting curve. However, the oddity is that there is a bump in the curve around the age of 20, with people recalling more information from this period than would be expected in a normal forgetting curve (see Rubin, Rahhal, & Poon, 1998). This is the **reminiscence bump** (see Figure 11.4). This phenomenon is so pervasive that it even influences the life periods from which we derive the topics of our dreams (Grenier et al., 2005). There are a number of explanations for this finding.

Cognitive Mechanisms. A general serial position effect exists in long-term memory. Part of this is an autobiographical memory primacy effect for first experiences of a certain type (e.g., your first kiss). One of the things about the age around which the reminiscence bump is centered is that this is a time when there is a great deal of change and a number of experiences are occurring for the first time, such as one's first kiss, first car, first apartment, first job, and so forth. Because there are so many firsts, it is not surprising that these memories are easier to recall. Thus, the reminiscence bump is partially due to a large number of primacy effects. For example, people who immigrated to the United States from Spanish-speaking

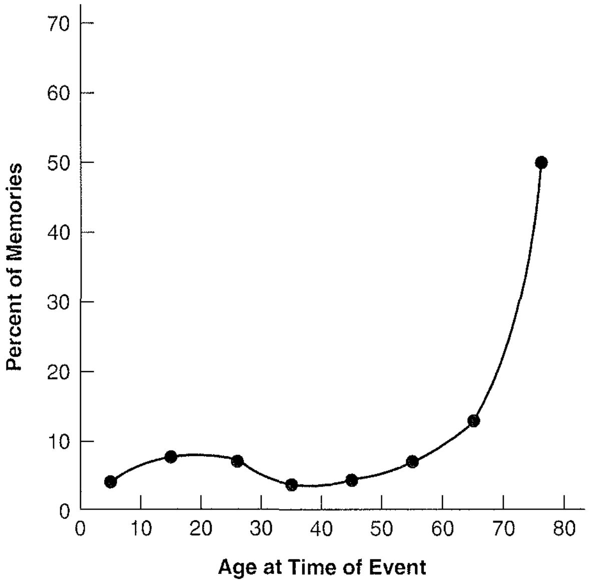

FIGURE 11.4 The Reminiscence Bump

Source: Rubin, D. C., Rahhal, T. A., & Poon, L. W. (1998). Things learned in early adulthood are remembered best. *Memory & Cognition, 26,* 3–19.

countries show reminiscence bumps at different times, depending on when they moved. The later they moved, the later the reminiscence bump. Moving to a new country with a new language provides a lot of novel first experiences (Schrauf & Rubin, 1998).

Neurological Changes. Another explanation for the reminiscence bump is neurological. This period of time is when a person is at his or her neurological and cognitive peak, when his or her nervous system is neither maturing nor declining. As such, people are at their best capacity to encode and store memories. Thus, memory should be more efficient at this time. Prior to this, people have difficulty encoding information into long-term memory. After this, beginning in the late 20s, one begins to see declines in memory.

Identity Formation. Another account of the reminiscence bump is that this is a time a person is making decisions about who he or she is with regard to preferences, ideologies, vocation, and so on (Rathbone, Moulin, & Conway, 2008). Although we can make these decisions at any time, more decisions are made at this time of life. These are decisions that shape our future choices and actions and become associated with them. A result of this increased interconnectivity is that, memories from this time are more available.

Cultural Schemas. A final explanation for the reminiscence bump is that people have schemas or "life scripts" for the important periods and major transition points of their life (Berntsen & Rubin, 2004). In American culture this would be things like graduating from school, getting married, buying a house, having a child, and so on. People then organize their autobiographical memories using these schemas. Then, when retrieving information, they use these schemas as a guide, thereby producing the reminiscence bump. In a study by Rubin and Berntsen (2003), college students estimated the likelihood that a typical 70-year-old would remember various life events. These students' estimates were very close to the actual pattern shown by older adults. Thus cultural expectations may guide the retrieval of autobiographical memories.

Because most of the events in cultural life schemas are positive (e.g., going to college, getting married, having a baby), this may also contribute to the bias for remembering more positive life events as time goes on (Berntsen & Rubin, 2002; Collins, Pillemer, Ivcevic, & Gooze, 2007), as well as those events that a person has a perceived sense of control (Glück & Bluck, 2007).

Also, in support of this view, a study by Copeland, Radvansky, and Goodwin (2009) had people read a novel (*The Stone Diaries*, by Carol Shields, which describe a person's entire life) and then were tested for their memory for the novel. Interestingly, a reminiscence bump was found, even though this was a story about someone else's life. Retrieval was guided by a cultural schema, and not by first events, neurological development, or a people's development of their self identity, all of which are impossible in this case.

Summary. There are several explanations for the reminiscence bump. The cognitive theory focuses on the uniqueness of initial experiences. The neurological theory focuses on the neurological peak. The identity formation account focuses on the development of one's self-identity. Finally, the cultural schemas account focuses on prior knowledge of how life is supposed to go. None of these explanations has a clear advantage over the others, and it seems likely that each of them plays a role in producing the reminiscence bump.

Flashbulb Memories

So far, our discussion of autobiographical memory has focused on relatively mundane aspects of life. However, we also have memories for surprising and important events that are very vivid, have a great deal of detail, and are relatively resistant to forgetting. For example, many people remember where they were and how they heard about the assassination of President Kennedy. A generation later, people can tell you detailed information about hearing about the explosion of the space shuttle *Challenger*. People are also likely to have such detailed memories for the news of Princess Diana's death (Hornstein, Brown, & Mulligan, 2003) or the terrorist attacks on September 11, 2001 (Lee & Brown, 2003; Schmidt, 2004; Tekcan, Ece, Gülgöz, & Er, 2003; Weaver & Krug, 2004), although such memories are better if they were personally experienced rather than simply heard about (Pillemer, 2009).

Highly detailed memories for surprising events are called **flashbulb memories** (Brown & Kulik, 1977) because it is as if the mind had taken a picture of the events that were occurring when the surprising information was learned. What is striking about flashbulb memories is that they contain detailed information for not only the event itself but also for the context in which it was learned. It is not unusual to find people who remember who told them the news, what the weather conditions were, whom they were with, where they were, what they were wearing, and so on. This contextual information is not directly relevant to what was learned. Still, it is stored at a high level of detail.

Flashbulb Memories Are Special. The original explanation for flashbulb memories was that there is a special memory process, called the "Now Print!" mechanism, somewhere in the neural coding of long-term memory (Brown & Kulik, 1977). This mechanism is triggered when something of great importance occurs to encode a great deal of detail. By storing all these details, a person can later sort out and identify the important components. This is especially critical for rare events because another experience of this type is unlikely. Thus, this would have some survival value. People are more likely to remember locations and from whom they heard the news (McKay & Ahmetzanov, 2005), although, interestingly, memory for the emotions experienced at the time is not well remembered (Hirst et al., 2009).

Flashbulb Memories Are Not So Special. Some researchers have suggested that flashbulb memories are just normal memories for important events because they can contain errors, become distorted, and are forgotten over time (Christianson, 1989; Lee & Brown, 2003; McCloskey, Wible, & Cohen, 1988; Schmolck, Buffalo, & Squire, 2000; Talarico & Rubin, 2003). They can also include misinformation from hearing other people's accounts of the event (Niedźwieńska, 2003). It may be that people are creating autobiographical stories for themselves that then remain relatively stable over long periods of time (Weaver & Krug, 2004). As an example of forgetting and distortion of flashbulb memories, a person might remember that he or she was having lunch with a friend when he or she heard the news, but in truth, the person he or she remembers having lunch with was somewhere else that day. Flashbulb memories may reflect a belief in the accuracy of the memories that emerges out of the emotional reaction to learning surprising news rather than the actual accuracy of the memory. The stronger the emotional reaction, the more a memory is believed (Talarico & Rubin, 2003). A clear example of how wrong a flashbulb memory can be is seen in the following quote from memory researcher Ulric Neisser (1982).

> For many years I have remembered how I heard the news of the Japanese attack on Pearl Harbor, which occurred on the day before my thirteenth birthday. I recall sitting in the living room of our house—we only lived in that house for one year, but I remember it well—listening to a baseball game on the radio. The game was interrupted by an announcement of the attack, and I rushed upstairs to tell my mother. This memory has been so clear for so long that I never confronted its inherent absurdity until last year: no one broadcasts baseball games in December! (It can't have been a football game either: professional football barely existed in 1941, and the college season ended by Thanksgiving.) (p. 45)

Criteria for Flashbulb Memories. Flashbulb memories differ from normal memories, even if they are created through normal mechanisms and are subject to forgetting. Flashbulb memories may be better records of the experience of a surprising event (our reaction) than of the event itself (Talarico & Rubin, 2009; Tekcan et al., 2003). Although they are not perfect, flashbulb memories do have distinguishing qualities, at least phenomenologically. It is only under rare circumstances when all of the relevant factors are present that a flashbulb memory is created (Conway et al., 1994).

So, when are flashbulb memories more likely to be formed? An outline of the more important criteria was provided by Finkenhauer et al. (1998), one of the best accounts of flashbulb memories (Luminet, 2009), and is shown in Figure 11.5. The first criterion is that the event be novel. That is, it should be a rare and, most likely, a new occurrence. For example, seeing the World Trade Center towers being attacked was a new event, but hearing about a murder on the evening news, sadly, is not. This novelty can lead to a feeling of surprise. This uniqueness and unexpectedness help it stand out in memory and be less likely to be influenced by interference. Also, because the event is surprising, people are likely to dedicate more effort in elaborative processing trying to make sense of the event and its consequences. This makes a flashbulb memory more complex and detailed as well as more enduring.

Also flashbulb memory creation requires that events be important and have significant consequences for the person witnessing or hearing about it. We better remember information that had an impact on our lives compared to more trivial information. For example, the events of September 11, 2001, were important and consequential, but a penny found in a parking lot is not.

The degree to which the events are surprising and important affects the person's emotional reaction. The more intense the reaction, the more likely a flashbulb memory will be formed. Emotionally intense events raise a person's arousal level, which aids memorization (Bradley, Greenwald, Petry, & Lang, 1992), perhaps influencing much of the effect of surprise (Hornstein et al., 2003). Note that not all flashbulb memories are formed from negative events, but can also be formed from very positive events, such as the positive flashbulb memories that some Germans have for when the Berlin Wall came down (Bonn & Berntsen, 2007), although these positive flashbulb memories tend to be less accurate than the negative ones. Emotion can lead to more attention to an event, more elaborative processing, and more remindings as subsequent consequences are encountered. All these facilitate the creation of a flashbulb memory. An emotional reaction can

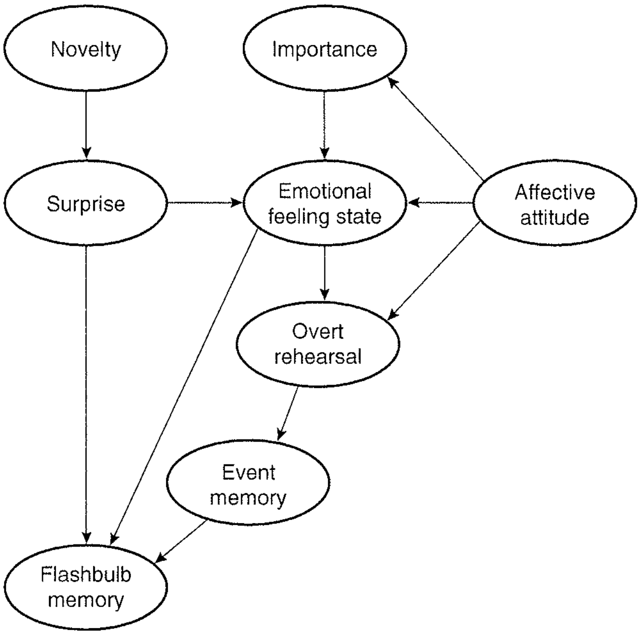

FIGURE 11.5 Outline of Major Factors in the Creation of Flashbulb Memories

Source: Finkenhauer, C., Luminet, O., Gisle, L., El-ahmadi, A., van der Linden, M., & Philipott, P. (1998). Flashbulb memories and the underlying mechanisms of their formation: Toward an emotional-integrative model. *Memory & Cognition, 26,* 516–531.

even override the novelty and surprise components for events that are expected, even if they are repeated, but which are emotionally intense. For example, a survey of gay men in the New York City area found that although there were repeated experiences of loved ones dying of AIDS, and the death was expected with the progression of the disease, the emotional intensity of each experience was sufficient to create lasting memories of hearing of the death (Mahmood, Manier, & Hirst, 2004). Thus, emotional reaction plays a pivotal role in forming flashbulb memories.

Another factor that influences flashbulb memory formation is affective attitude. These are the person's opinions and beliefs prior to the event that can provide the basis for later elaborative processing. If a person lacks the requisite knowledge to understand or think deeply about an event, a flashbulb memory is less likely to occur. For example, if a popular sports figure suddenly retires, people who are not fans of that sport will consider that news insignificant and will not form a flashbulb memory. In contrast, a person who is an avid fan may form a flashbulb memory.

Finally, people engage in more rehearsal of a flashbulb memory event by discussing it with others. When these events occur, people spend a great deal of time thinking about it and how they heard about it, including discussing with others how they heard about it and their reactions to it. If it is a public event, the news media repeatedly devotes intense coverage to it. This dwelling on and sharing of the information affects memory. The memory traces are reinforced and strengthened, decreasing the likelihood that forgetting will occur, and are a form of overlearning.

Synopsis

Autobiographical memories are affected by the passage of time and other influences that are unique to this type of memory. The inability to produce autobiographical memories from the first few years of life is infantile amnesia. Also, as we age, there is a change in the forgetting curve, such that there is better memory for events around the age of 20 as with the reminiscence bump. Finally, memories of surprising and emotionally engaging events can lead to flashbulb memories that are remarkably resistant to forgetting.

SUMMARY

Autobiographical memory is memory for the events of one's life. This life narrative can be examined at a number of different levels, including specific events, repeating or extended general events, and thematically organized lifetime periods. This distinction is supported by evidence from people with brain damage, who remember information at one level but not another. Many autobiographical memories are reconstructed as a person tries to remember, using scripts and schemas. The parts of an event that are most likely to be accurately remembered are the unexpected and important parts, not the mundane and trivial ones, with emotion having an especially large impact. Autobiographical memory changes over the life span. Adults have almost no memories for the first few years of life. Moreover, although a person continues to lose memories due to forgetting, the time from 15 to 25 years of age tends to be better remembered. Finally, some events that have such a profound impact on our lives in that relatively few details are forgotten.

STUDY QUESTIONS

1. In what ways are autobiographical memories like episodic memories? Like semantic memories?
2. How quickly can people retrieve autobiographical information? How does this compare to information learned in the lab? What does this tell us about autobiographical memories?
3. What are the three levels of autobiographical memory? What are their characteristics?
4. What neurological evidence supports the idea that there are different levels of autobiographical memories?
5. How is autobiographical memory like a story or narrative? How does this affect how memories are remembered?
6. What are the two types of perspectives that one can take on an autobiographical memory? What sorts of factors influence which of these two occur?
7. What is better remembered from autobiographical memories, the schema consistent or inconsistent details? What theory accounts for this and how?
8. What role does emotion play in the creation and maintenance of autobiographical memories?
9. During what period of a person's life does infantile amnesia occur?

10. What are some of the causes of infantile amnesia? How credible is each of these?
11. What is the reminiscence bump? Why does it occur?
12. What are flashbulb memories? What causes them? How much are they like or dislike regular memories?

KEY TERMS

autobiographical memory, event-specific memories, field memories, flashbulb memories, general events, infantile amnesia, life narrative, lifetime periods, observer memories, tunnel memories, reminiscence bump

TRY IT OUT

One aspect of autobiographical memory is that is has a strong **temporal order bias.** For the most part, people prefer remembering events from the beginning to the end. This can be illustrated by asking people to recall 10 details from a set of 12 events. Have people recall the details of four events in a forward order (from the beginning to the end), four in a backward order (from the end to the beginning), and four events in an importance order, starting with the most important detail and then proceeding to the least important. Have at least 12 people write these details down on a sheet of paper, for each event, numbered from 1 to 10. You should also time how long people take to do each one. Here are 12 life events you can use, although you can think of your own if you wish: "going to a birthday party," "getting an important message," "visiting relatives," "going on a shopping trip," "playing a game," "getting a job," "moving to a new home," "learning to drive," "coming home from school," "taking a trip," "meeting a new friend," and "attending a sporting event." You should mix up which events get assigned to which condition for each person, as well as the order of the conditions. When you are done, if all goes well, people will recall more details and/or be fastest for details recalled in a forward order compared to a backward or based on importance, thereby illustrating the sequential nature of autobiographical memories.